I discussed this problem set with Andrew Perry.

A)

$$V_u(A,\tilde{Y}) = \max_{A'_u,\tilde{Y}'} \Big\{ u(C_u) + \beta\big(E[V_u(A'_u,\tilde{Y}')]\cdot(1-q) + E[V_e(A'_u,\tilde{Y}')]\cdot q\big)\Big\}$$
$$V_e(A,\tilde{Y}) = \max_{A'_e,\tilde{Y}'} \Big\{ u(C_e) + \beta\big(E[V_u(A'_e,\tilde{Y}')]\cdot p + E[V_e(A'_e,\tilde{Y}')]\cdot(1-p)\big)\Big\}$$
$$C_u = A + b - \frac{A'_u}{1+r}$$
$$C_e = A + \tilde{Y} - \frac{A'_e}{1+r}$$
$$\tilde{Y}' = (1-\rho)\mu + \rho\tilde{Y} + \varepsilon$$
$$\varepsilon \sim N(0,\sigma^2)$$
$$u(C) = \frac{C^{1-\gamma}}{1-\gamma}$$
$$A \geq 0$$

B)

C)

D)

E)
Notice if unemployment didn't exist then in expectation,

$$Y = (1-\rho)\mu + \rho * Y + \varepsilon \Rightarrow Y = \mu + \frac{\varepsilon}{1-\rho} \Rightarrow E[Y] = \mu + 0 = \mu$$

Let 0 be the minimum assets since $A_t \geq 0$ for all time t. Because there are two states of employment: employed where the household earns μ in expectation and unemployed where the household earn .4 or 40% of μ. This means that if a household is already in the unemployment state, during each period of unemployment, households are earning .6 less than they would be in expectation. Since probability of staying unemployed is $1-q = 1-0.25 = 0.75$, then households will want to save in order to take the unemployment hit forever which is

$$0.6 + 0.6\cdot 0.75 + 0.6\cdot 0.75^2 + \ldots = 0.6\sum_{n=1}^{\infty} 0.75^n = 0.6\cdot\frac{1}{1-0.75} = 2.4.$$

If we assume that households want to be able to absorb 2.5 times the amount of this shock, then we can set the maximum value of A to $2.4\cdot 2.5 = 6$.